

(Le Chatelier's principle (effects of concentration, pressure, temperature))

Q1. (2023)

shifts to the left

Q2. (2023)

the mixture is a lighter shade of brown

Q3. a). (2023)

no effect (on equilibrium position)

(because) there are equal numbers of (gas) moles / molecules on each side (of the equation)

Q3. b). (2023)

no effect (on equilibrium position)

Q4. a). (2023)

add more hydrochloric acid

Q4. b). (2023)

(because the) forward and reverse reactions are taking place at (exactly) the same rate

Q5. a). (2024)

(test) add barium chloride (solution)

(result) white precipitate

Q5. b). (2024)

the yield is smaller at higher temperatures because the reaction is exothermic

Q5. c). (2024)

there are more moles / molecules (of gas) on the left

(so the position of) equilibrium shifts to the right

Q5. d). (2024)

any **two** from:

- the yield is already high
- more energy required
- risk of explosion is increased
- higher income from increased yield is outweighed by the extra expenditure
- increased cost of safety precautions

Q5. e). (2024)

vanadium (V)